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3120

REQUENCY SELECTIVE VOLTMETER

RYCOM
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RYCOM INSTRUMENTS
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3120

FREQUENCY SELECTIVE VOLTMETER

Serial No. _____

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3120 SELECTIVE VOLTMETER
SER. NO.
RYCOM
INSTRUMENTS
RAYTOWN, MO.
CAL LEVEL
ATTENUATOR
DB
VOLTS
CAL
BAL
INPUT
BRIDGE
600 Ω
135 Ω
CAL
INPUT SELECTOR
2.5KC
250~
SELECTIVITY
BATTERY TEST
PULL ON
AUDIO LEVEL
AM
LSB
USB
MONITOR
HEADSET
115 VAC
1.0MC
500KC
1KC
1.5MC
1.0MC
500KC
A
B
C
BAND SELECTOR

Figure 1

CHAPTER I

GENERAL

1. SCOPE.

This manual describes the RYCOM Model 3120 and 3125 Frequency Selective Voltmeters. It is battery operated requiring 115 VAC power for battery charging.

The 3120 Frequency Selective Voltmeter is intended for general use where it is desired to measure the level of individual or a narrow band of frequencies.

The 3125 Frequency Selective Voltmeter operates the same as the 3120 voltmeter. It has a special input circuit to allow connection to a 20 pin connector on Western Electric O, N and ON carrier systems.

Table 1 lists the specifications and Table 2 lists the operating controls and indicators for the voltmeter. Figure 1 shows a photograph of the Voltmeter.

2. DESCRIPTION.

The Voltmeter is a fully transistorized battery operated instrument that measures voltage from 7.75 microvolts to 9.75 volts (-100 DBM to +22 DBM) in a frequency range of 1 KC to 1.5 megacycles. The Voltmeter has a 250 cycle bandwidth filter that makes it particularly useful for analyzing complex wave forms, determining carrier system levels and checking amplitude modulation percentages. It also has a 2.5 KC bandwidth filter for measuring single sideband carrier noise and for suppression of unwanted signals. Special features include an internal oscillator for calibration purposes, a loudspeaker or headphone jack for aural monitoring and a built-in battery charger.

A compact metal cabinet 8 inches high, 12 inches wide and 9 inches deep is used to house the instrument. The weight of the instrument with battery is 14 pounds. The front panel contains all of the operating controls and is protected from damage by a metal cover that fastens in place by snaps. The audio level control switch will be placed in the OFF position when the cover is installed, thereby preventing the possibility of battery discharge while the instrument is not in use.

The major portion of Voltmeter circuitry is laid out on printed circuit boards and assembled into six separate modules. Extensive shielding is provided for modules and components to prevent interaction between circuits.

The Voltmeter is powered by a rechargeable nickel-cadmium battery for up to 35 hours of operation without charging. A polar three-pin male connector mounted to front panel provides access for battery charging from 115 VAC 60 cycles. The voltmeter may be operated while charging.

Table 1 SPECIFICATIONS

FREQUENCY RANGE:	1 KC to 1.5 megacycles.
INPUT LEVEL:	Model 3120: 7.75 uV to 10V; 135 and 600Ω -100 to +22 dbm; 600Ω only
	Model 3125: 7.75 uV to 10V; 600Ω only -100 to +22 dbm; 135 and 600Ω
METER INDICATION:	Model 3120: Voltage and DBM on 600Ω line, voltage only on 135Ω line.
	Model 3125: Voltage and DBM on 600Ω line, DBM only on 135Ω line.
TEMPERATURE RANGE:	-10°C to +55°C
FREQUENCY ACCURACY:	±1KC
MEASUREMENT ACCURACY:	±.5 DB
SELECTIVE VOLTMETER BANDPASS:	250 cycle ±25 cycles at 3 DB down 500 cycle at 30 DB down 1000 cycle at 60 DB down
AUDIO MONITOR BANDPASS:	2500 cycle at 3 DB 11000 cycle max. at 60 DB down
SPURIOUS RESPONSE:	Greater than 55 DB
INTERMEDIATE FREQUENCY:	2215 KC
INPUT IMPEDANCES:	600Ω (balanced or unbalanced) 135Ω (balanced or unbalanced) Bridging (balanced or unbalanced) 5,000Ω
POWER SUPPLY:	12 volt nickel-cadmium battery 115 volts AC for charging battery
CURRENT DRAIN:	35 MA average
BATTERY LIFE:	35 hours without recharging
OVERALL DIMENSIONS:	8" h x 12" w x 9" d
WEIGHT:	14 lbs.

Table 2 OPERATING CONTROLS AND INDICATORS

Panel Marking	Description	Function
BAND SELECTOR	3 position rotary switch	(1) sets frequency of band to be tuned. (A) 1 KC to 500 KC (B) 500 KC to 1.0 MC (C) 1.0 MC to 1.5 MC
TUNING	Driven tuning mechanism, 2 speed	Tunes Voltmeter to frequency indicated on dial face
SELECTIVITY	2 position rotary switch	Sets bandwidth 250~ or 2.5 KC
ATTENUATOR	11 position rotary switch	Serves as level range control by controlling Voltmeter sensitivity in 10 DB steps up to 100 DB.
INPUT SELECTOR	Model 3120: 4 position rotary switch. Model 3125: 11 position rotary switch.	(1) 600Ω or 135Ω (3120) or TERM (3125) positions connect Voltmeter input circuits to input jacks for terminated inputs. (2) BRIDGE (3120) or BRG (3125) position connects Voltmeter input circuits to input jacks for bridging measurement. (3) CAL switches input circuit for calibration. (4) Model 3125: IN and OUT positions connect Voltmeter input circuit to 20 pin connector A1J1.
CAL LEVEL	Potentiometer	Adjust overall Voltmeter gain when calibrating.
MONITOR	3 position rotary switch	Switch for AM and single sideband (LSB, USB) demodulation
AUDIO LEVEL & PULL ON	Potentiometer & switch	(1) Adjust AUDIO LEVEL for speaker or headset level. (2) PULL ON provides connection of battery power to unit.
HEADSET	Headphone jack	Provision for audio monitoring
115 VAC	Cord and connector, polarized	115 volt cord and connector for charging circuit & AC operation.
INPUT	Model 3120 & 3125: Binding Posts Model 3125: 20 pin connector	Input connectors for 135Ω or 600Ω line measurements. Shorting link is used on unbalanced lines.

CHAPTER II

OPERATION

1. PREPARATION.

The Voltmeter has been thoroughly inspected at the factory and is covered by Warranty. Prior to use, the instrument should be inspected, for in-transit damage.

If damage has occurred it should be reported to the carrier and to Rycom Instruments Inc.

The Voltmeter is shipped complete with battery installed and is shipped in a corrugated container.

2. BATTERY.

The battery will provide up to 35 hours of operation between charges. A completely discharged battery will recharge in eighteen hours or less. Continuous charging is permissible without damage to the battery. It is recommended that a routine recharging schedule be established depending upon unit use. The battery should be charged at least once per month.

The following check tests the condition of the battery while battery is delivering full load current.

a. Pull AUDIO LEVEL control to switch power on. Press BATTERY TEST switch.

b. Observe meter. Battery is fully charged when the meter indicates 0 DB ±.5 DB. If the indication is below -.5 DB recharge battery.

3. OPERATIONAL CALIBRATION.

This procedure checks the main tuning dial and the overall Voltmeter sensitivity.

To calibrate the Voltmeter proceed as follows:

a. Set INPUT SELECTOR switch to CAL position.

b. Set ATTENUATOR switch to -30 DB CAL position.

c. Set SELECTIVITY to 250~.

d. Set BAND SELECTOR to band A.

e. Rotate TUNING dial control to 250 KC.

f. Adjust TUNING control for maximum indication on the meter.

g. Adjust CAL LEVEL control for 0 DBM indication on meter. The Voltmeter is now calibrated for overall sensitivity.

h. A frequency check may be made by tuning dial throughout its range. An indication will be noted at every 250 KC point (i.e. 500, 750, 1000, 1250 and 1500 KC).

4. LINE MEASUREMENTS - Model 3125 using 20 Pin Connector.

The 20-pin input connector is provided for patching into 135 ohm carrier lines. To perform 135 ohm carrier line measurements, proceed as follows:

a. Patch Voltmeter to circuit to be tested.

b. Calibrate Voltmeter per paragraph 3.

c. Set INPUT SELECTOR switch as required for circuit to be measured.

d. Rotate BAND SELECTOR and TUNING control to frequency of signal to be measured.

e. Rotate ATTENUATOR selector switch until meter reading is in upper 2/3 of scale.

f. Adjust TUNING control for maximum indication on meter.

g. Read meter indication in DBM. To obtain the input signal level, algebraically add meter indication to attenuator setting.

5. LINE MEASUREMENTS - Input Jacks.

The input jacks are provided for making measurements on 135 ohm and 600 ohm, balanced or unbalanced lines. To perform line measurements, proceed as follows:

a. Connect Voltmeter to circuit to be tested. For unbalanced lines use shorting link. For balanced lines disconnect shorting link.

b. Calibrate Voltmeter per paragraph 3.

c. Set INPUT SELECTOR switch to desired impedance setting, see 5h.

d. Rotate TUNING control and switch BAND SELECTOR to frequency range being measured.

e. Rotate ATTENUATOR selector switch until meter indication is in upper 2/3 of scale.

f. Adjust TUNING control for maximum indication on meter.

g. Read meter indication, see 5h. To obtain the input signal level, algebraically add the meter indication to the ATTENUATOR setting.

h. Correlation of impedance and voltage or DBM meter indication.

Volt-meter	Input Selector Position	Internal Terminating Impedance	Measurement - Source Impedance
3120	BRIDGE	5000Ω	Volts from any low impedance source and DBM from 600 ohm source.
	600Ω	600Ω	Volts or DBM from 600 ohm source.
	135Ω	135Ω	Volts from 135 ohm source.
3125	TERM 135Ω BRG 135Ω	135Ω 5000Ω	DBM from 135 ohm source.
	BRG 600Ω	5000Ω	Volts from any low impedance source and DBM from 600 ohm source.
	TERM 600Ω	600Ω	Volts or DBM from 600 ohm source.

6. MONITORING.

Provision is made to monitor audio signals that may be present on line signals under measurement. To monitor audio signals switch SELECTIVITY to 2.5 KC, adjust AUDIO LEVEL control and set MONITOR switch in desired position, AM, LSB or USB.

CHAPTER III

THEORY OF OPERATION

1. GENERAL.

The Voltmeter employs a single conversion superheterodyne circuit to measure frequencies in the range of 1 KC to 1.5 MC with a bandpass of 250~ or 2.5 KC. Figure 12 illustrates a functional block diagram of the Voltmeter. Figure 13 shows a schematic diagram of the Voltmeter.

At the input of the Voltmeter, a switch is used to select the input signal from either the 250 KC calibrate oscillator or from the front panel input connectors. A filter and matching network is incorporated in the input circuits to attenuate unwanted high frequency components and to provide proper input impedances.

To control the sensitivity of the Voltmeter, a variable attenuator provides up to 100 DB of attenuation in 10 DB steps. Tuning of the Voltmeter is accomplished by a variable oscillator (local oscillator) that operates over the frequency range of 2215 KC to 3715 KC. Both the input signal and the local oscillator signal are applied to a mixer stage where the heterodyning action takes place to produce a 2215 KC difference frequency. The IF amplifier is tuned to 2215 KC and amplifies the output of the mixer.

To improve image rejection a high side signal oscillator insertion scheme is employed. The 250~ and 2.5 KC bandpass of the Voltmeter is determined by crystal filters located between the 1st and 2nd IF amplifiers, the signal is rectified and filtered in a meter detector circuit and then applied to a meter.

The second detector when used with insertion frequency of 2213.5 KC and 2216.5 KC will produce single sideband demodulation for audio monitoring.

The calibrate oscillator generates a 250 KC square wave and is regulated for amplitude level to provide an output level that is equivalent to -30 DBM at the input connectors. Before voltage measurements are made the Voltmeter sensitivity is calibrated by connecting the calibrate oscillator output to the Voltmeter input circuits and adjusting the IF amplifier gain for 0 DBM indication.

When the Voltmeter is used for voltage measurements, the variable attenuator is used to change the Voltmeter sensitivity in calibrated steps of 10 DB. For example, assume that a signal level of -42 DBM is applied to the input of the calibrated Voltmeter. Adjusting the attenuator to the -40 DB position will result in an indication of -2 DB. The input level is determined by algebraically adding the meter indication to the attenuator setting: -40 DB -2 DB = -42 DBM.

2. INPUT MODULE A1.

The input circuits are composed of an INPUT SELECTOR switch S1, an isolation transformer T1, and a 100 DB ATTENUATOR S2. Input signals are applied to the input binding posts, E1, E2 and E3 (or the 20 in INPUT connector J1 on model 3125). The INPUT SELECTOR switch S1 selects and applies the proper input signal to transformer T1.

Resistors R1 or R2 are switched by S1 to provide termination for 135 ohm or 600 ohm lines. In the 3125 model, switch S1 also switches the compensating pad R3, R4 and R5 into the circuit for voltage or DBM measurements on 600 ohm lines. The pad is switched out for DBM measurements on 135 ohm lines.

3. EMITTER FOLLOWER AND CALIBRATE OSCILLATOR MODULE A2.

The function of the bootstrapped emitter follower is to match the attenuator S2 to the lowpass filter FL3.

The calibrate oscillator is 250 KC crystal controlled, biased so that the output voltage swings between the regulated power supply voltage and ground. The output is applied through a CAL OSC LEV potentiometer R101 to switch S1 for calibrating the Voltmeter level and to check the dial frequency accuracy.

4. LOWPASS FILTER FL3.

The lowpass filter is a two-section pi constant K derived, with M derived end sections. The cutoff frequency is 1.76 MC and provides 60 DB of attenuation at 2215 KC. The input and output impedances are 150 ohms.

5. OSCILLATOR-MIXER MODULE A3.

The input signal is heterodyned with the local oscillator injection in balanced modulator diodes CR1 and CR2. The modulator diodes operate as a balanced shunt modulator and short the signal to ground during half the local oscillator cycle. The 2215 KC output of the modulator is capacitive coupled to the base of the first IF amplifier A4Q1.

The modulator driver (Q1) output is transformer (T1) coupled to the modulator diodes. The signal level at the junction of the modulator diodes is very small due to the matching of components. The input to the modulator driver is capacitive coupled from the emitter of the local oscillator Q2.

The local oscillator is a Colpitts type with three switched frequency bands. The frequency on each band is varied by tuning C1, an 11-150 uuf air variable capacitor. The oscillator circuit is temperature stabilized by C11.

6. IF AMPLIFIER MODULE A4.

The 2215 KC output of the modulator is capacitive coupled to the base of Q1 in the first IF amplifier. The amplifier and filter driver consists of three stages, Q1, Q2 and Q3 and has 36 DB gain. Q1 and Q2 is a Darlington connected amplifier, the output of which is transformer coupled to Q3, a filter driver amplifier.

The Voltmeter contains two crystal filters which are selected by switch S4. The center frequency of both filters is 2215 KC and the bandwidths are 250~(FL1)and 2.5 KC (FL2)at 3 DB down. Trimmer capacitors C7 through C10 tune the filters for maximum flatness. Each filter has an input impedance of 4000 ohms and an output impedance of 1000 ohms.

The filter matching and second IF amplifier consists of three stages, Q4, Q5 and Q6. The output of the crystal filter is capacitively coupled to the Darlington connected amplifier consisting of Q4 and Q5. The bias on the emitter of Q5 is adjusted by R2 (CAL LEVEL). Changing the bias, controls the gain of the stage. The output of Q5 drives the common emitter amplifier Q6. The second IF amplifier Q6 has a gain of 20 DB to 50 DB depending upon the setting of R2.

The third IF amplifier Q7 provides 30 DB of gain and is transformer coupled to the IF output amplifier Q8. The output is also capacitive coupled to the meter detector circuit.

The meter detector diode CR1 is a peak envelope type detector. The output is applied through R27 to S6 which is connected to the meter.

The IF output amplifier Q8 provides isolation of the reinsertion oscillator signal and also drives the demodulator diodes CR2 and CR3.

7. DEMODULATOR MODULE A5.

The AM demodulator is a shunt type using CR3 as the diode. S5 connects the anode end direct to ground when in AM position. L2 and C10 provide filtering for the RF present. The audio signal is capacitive coupled from R1 (AUDIO LEVEL) to the base of Q5, the first audio amplifier.

The sideband demodulator consists of CR2 and CR3 which are supplied with an injection signal from Q4. These diodes operate as a balanced shunt demodulator and shorts the IF signal to ground during half the injection signal cycle. This produces an audio difference signal which is coupled to the base of the first audio amplifier Q5.

The carrier reinsertion oscillator Q3 is crystal controlled by Y1 and Y2. MONITOR switch S5 applies power to Q3 and Q4, and selects the crystal for LSB or USB demodulation. The output is capacitive coupled to balanced phase splitter Q4, which supplies out-of-phase signals to the demodulator diodes CR2 and CR3.

8. AUDIO AMPLIFIER, MODULES A5 AND A6.

The 1st and 2nd audio amplifier are on module A5 and the audio output amplifier is on module A6. The first audio amplifier Q5 is bootstrapped to provide a high impedance load for the demodulators. The second audio amplifier Q6 is a common RC type amplifier. The audio output amplifier module A6 consists of a driver Q1, a quasi-complementary pair Q2, Q3, which drives a push-pull pair Q4, Q5. Diodes CR1, CR2 and CR3 provide biasing for Q2 and Q4. This arrangement saves battery drain during absence of audio signal. More circuit detail can be obtained from latest textbooks for this type circuit.

9. REGULATOR AND CHARGER, MODULE A5.

The regulator is a series type, with Q1 as the series regulator transistor, and Q2 as the control amplifier. VR1, a 9.1 volt reference diode, controls the bias on Q2. The output is also connected through resistor R4 to the battery test switch for checking battery condition. A meter reading of 0 DB $\pm$.5 DB indicates the battery charge is adequate for unit operation.

The battery BT1 charging circuit consist of CR1, C2 and R3 on the module and power transformer T1 which is mounted on the chassis. The charging circuit is activated anytime the unit is connected to a 115 VAC 60 cycle source through the power cable supplied.

CHAPTER IV

MAINTENANCE

1. INTRODUCTION.

This equipment will give comparatively trouble free performance provided normal operating procedures are observed. In the event of any malfunction, first check the battery by turning the unit ON, press the BATTERY TEST button and observe the meter for a 0 DB ±.5 DB reading.

Before attempting to trouble shoot the Voltmeter, Chapter III "Theory of Operation" should be studied. The trouble shooting procedure consists of three parts: Isolation to a particular module, module trouble shooting and transistor voltage checks.

2. TEST EQUIPMENT.

The following test equipment is required to test and align the Voltmeter and is not supplied.

a. Sweep Generator and Display Unit. Use to align IF amplifier and crystal filters.

   1. Center frequency between 50 KC and 500 KC.

   2. Sweep width variable from 5 KC to 40 KC.

   3. Sweep rate 1 to 4 per second.

b. VTVM. (Triplett 850 or equivalent).

c. Counter.

   1. Minimum counting rate 3 MC.

   2. Gate time 1 second and .01 second.

   3. Display time variable.

d. Signal Generator. (Measurements 65-B or equivalent).

e. AC-VTVM. (Hewlett-Packard 400L or equivalent).

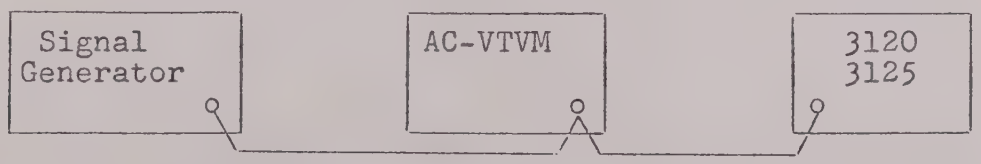


Figure 2
Test Set Up for Module Isolation

3. TROUBLESHOOTING.

Before proceeding with step 1 in Table 3, connect Voltmeter in the test setup shown in Figure 2 and perform the following steps.

a. Set the Voltmeter as follows.

1. INPUT SELECTOR to BRIDGE (3120) or BRG 600Ω (3125).
2. BAND SELECTOR to band A.
3. TUNING to 250 KC.
4. ATTENUATOR to -60 DB.
5. CAL LEV full clockwise.
6. SELECTIVITY to 2.5 KC.

b. Adjust signal generator to 0.78V, 250 KC signal output.

Table 3 MODULE ISOLATION

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Turn unit on. Press BATTERY TEST switch.	Meter reads 0 DB ±.5 DB.	Battery needs recharge or power supply regulator is defective on Module A5. See Table 4.
2	Set INPUT SELECTOR to BRG*. Connect VTVM to pin 7 on Module A2.	VTVM indicates 77 millivolts.	Trouble is in input Module A1. See Table 5.
3	Set INPUT SELECTOR to CAL. Connect VTVM to pin 7 on Module A2.	VTVM indicates 2.5 millivolts.	Trouble is in calibrate oscillator on Module A2. See Table 7.
4	Set INPUT SELECTOR to BRG*. Connect VTVM to pin 1 on Module A2.	VTVM indicates 34 millivolts.	Trouble is in Emitter follower on Module A2. See Table 6.
5	Set INPUT SELECTOR to BRG*. Connect VTVM to pin E2 on Module A4.	VTVM indicates 30 millivolts.	Trouble is in FL3 lowpass filter. See Table 8.
6	Set BAND SELECTOR to band A. Tune dial to zero frequency.	Voltmeter meter reads past full scale.	Trouble is in Module A3. See Table 9.
7	Set INPUT SELECTOR to BRG*. Tune dial to 250 KC. Set ATTENUATOR to 0 DBM. Connect VTVM to E5 on Module A4.	VTVM indicates .48 volts.	Trouble is in Module A4. See Table 10.
8	Set INPUT SELECTOR to BRG*. Connect VTVM to E8 Module A5. Set monitor switch to LSB. Audio level to 1/3 CW.	VTVM indicates .56 volts.	Trouble is in sideband oscillator Module A5. See Table 11.
9	Set INPUT SELECTOR to BRG*. Connect VTVM to E11 on Module A5. Set MONITOR switch to LSB. AUDIO LEVEL to 1/3 CW.	VTVM indicates 1.6 volts.	Trouble is in audio amplifier Module A5. See Table 12.
10	Set INPUT SELECTOR to BRG*. Set MONITOR switch to LSB. Set AUDIO LEVEL to 1/3 CW.	Aural indication from speaker.	Trouble is in audio amplifier Module A6. See Table 12.

*Model 3120: BRIDGE
Model 3125: BRG 600Ω

Table 4 REGULATOR AND CHARGING CIRCUIT MODULE A5

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Connect VTVM to E4 on Module A5.	VTVM indicates 11.5 to 13.5 volts DC.	Check battery connections. Battery needs recharging.
2	Connect VTVM to E1 on Module A5. Pull AUDIO LEVEL switch on..	VTVM indicates 11.5 to 13.5 volts DC.	Check switch S7 and connections.
3	Connect VTVM to E7 on Module A5. Pull AUDIO LEVEL switch on.	VTVM indicates 9.1 volts DC.	Check Q1 and Q2 voltages. See Table 13.

Table 5 INPUT MODULE A1

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Model 3120: Set INPUT SELECTOR to BRIDGE. Connect AC-VTVM to pin 8 of S1. Set ATTENUATOR to -80 DB.	AC-VTVM indicates .78 volts.	Check C1,T1 and switch S1 connections for continuity.
	MODEL 3125: Set INPUT SELECTOR to BRG 600Ω. Connect AC-VTVM to pin 6, Sec. C of S1. Set ATTENUATOR to -80 DB.		
2	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to pin 7 on Module A2. Set ATTENUATOR to -80 DB.	AC-VTVM indicates .78 volts.	Check S2 and resistors R6 thru R18.

Table 6 EMITTER FOLLOWER MODULE A2

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set signal generator to 250 KC at -30 DB and connect to pin 7 of Module A2. Connect AC-VTVM to pin 1.	AC-VTVM indicates 11 millivolts.	Check Q1 voltages. See Table 13.

*Model 3120: BRIDGE
Model 3125: BRG 600Ω

Table 7 CALIBRATE OSCILLATOR MODULE A2

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set INPUT SELECTOR to CAL. Connect AC-VTVM to pin 4 on Module A2.	AC-VTVM reads 26 millivolts.	Check Q2 voltages. See Table 13.

Table 8 LOWPASS FILTER FL3

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set signal generator to 250 KC at 24.5 MV and connect to IN on FL3. Connect AC-VTVM to pin OUT on FL3.	AC-VTVM reads 22 millivolts.	Check continuity of FL3.
2	Connect ohmmeter from pin IN to OUT.	Ohmmeter reads 2Ω.	Trouble is in FL3.

Table 9 LOCAL OSCILLATOR MODULE A3

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Turn unit on. Connect AC-VTVM to junction of R1 and CR1.	AC-VTVM reads .55 volts.	Check Q1,Q2 voltages. See Table 13.
2	Connect AC-VTVM to junction of R5 and R6.	AC-VTVM reads between .15 and .3 volts.	Check Q2 voltages. See table 13.

Table 10 IF AMPLIFIER MODULE A4

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set signal generator to 2215 KC at -100 DB (7.75 uV) and connect to E2 on Module A4. CAL LEVEL fully CW. Set SELECTIVITY to 2.5 KC.	Voltmeter reads -6 DBM.	Adjust T1,T2 and T3 for maximum reading on meter. Check Q1 thru Q8 voltages. See Table 13.

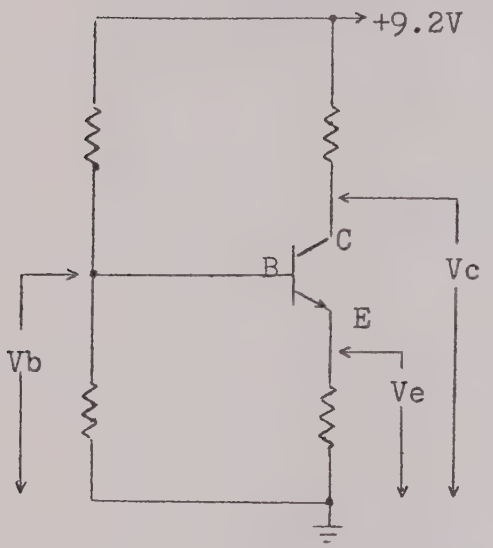
Table 11 REINSERTION OSCILLATOR MODULE A5

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Turn MONITOR to LSB. Connect AC-VTVM to base of Q4.	AC-VTVM reads .75 volts.	Check Q3 voltages. See Table 13. Check crystals.
2	Connect AC-VTVM to junction of C8 and R13.	AC-VTVM reads 0.5 volts.	Check Q4 voltages. See Table 13.

Table 12 AUDIO AMPLIFIER MODULE A5 and A6

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set signal generator to 1 KC at 50 millivolts and connect to E9 on Module A5. Turn R1 AUDIO LEVEL maximum CW. Connect AC-VTVM to base of Q6.	AC-VTVM reads 85 millivolts.	Check Q5 voltages. See Table 13.
2	Connect AC-VTVM to E11 on Module A5.	AC-VTVM reads 3 volts.	Check Q6 voltages. See Table 13.
3	Connect AC-VTVM to E3 of Module A6.	AC-VTVM reads 3.5 volts.	Check Q1,Q2,Q3, Q4 and Q5 voltages. See Table 13.

Typical transistor trouble shooting. Figure 3 presents typical trouble shooting for a N-P-N common emitter amplifier stage. Before replacing transistor, check associated circuit components. See table 13 for typical transistor voltages.



a. If Ve is less than indicated and Vb is normal, transistor is open.

b. If Ve is greater than indicated and Vb is normal, transistor is shorted.

c. The normal voltage between base and emitter of an amplifier stage is between .4 and .7 volts.

B - Base
C - Collector
E - Emitter

Vb - Base Voltage
Vc - Collector Voltage
Ve - Emitter Voltage

Figure 3
Typical Transistor Trouble Shooting Schematic.

TI414 & TI417

2N3638

Figure 4
Encapsulated Transistor Lead Configuration.

4. ALIGNMENT.

a. Calibrate Oscillator. In the event of parts replacement or normal aging of parts, it may be necessary to calibrate the Voltmeter. This is accomplished by comparing the calibrate oscillator output level to a known external source. The equipment should be connected as shown in Figure 5 before proceeding with step 1 through 8.

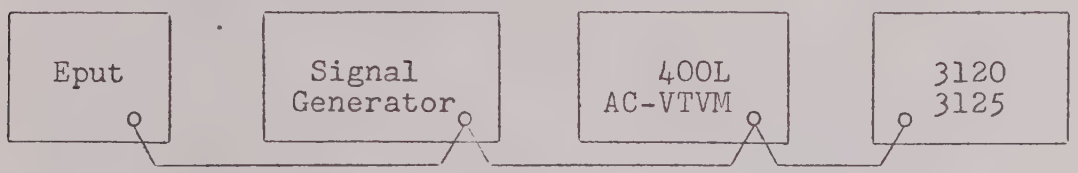


Figure 5
Test Set Up for Level Calibration

1. Adjust Voltmeter controls as follows:

   a. INPUT SELECTOR to BRIDGE (3120) or BRG 600Ω (3125).
   b. SELECTIVITY to 250~.
   c. ATTENUATOR to -30 DB CAL.
   d. BAND SELECTOR to band A.
   e. TUNING to 250 KC CAL.

2. Adjust signal generator frequency to 250 KC.
3. Adjust signal generator output to -30 DB (24.5 mv) level.
4. Adjust TUNING control for maximum reading on meter.
5. Adjust CAL LEVEL for 0 DBM reading on meter.
6. Set INPUT SELECTOR to CAL position.
7. Adjust TUNING control for maximum reading on meter.
8. Adjust CAL OSC LEV (R101) on module A2 for 0 DBM reading on meter. The Voltmeter is now calibrated and ready for operation.

b. IF Amplifier. The alignment of the 2215 KC IF amplifier, module A4, is performed by using the internal calibrate oscillator as a signal source. Proceed as follows:

1. Set Voltmeter controls as follows:

   a. INPUT SELECTOR to CAL.
   b. ATTENUATOR to -30 DB CAL.
   c. SELECTIVITY to 250~.
   d. BAND SELECTOR to band A.
   e. TUNING to 250 KC CAL for maximum Voltmeter reading.

2. Adjust CAL LEVEL so meter reads in upper half of scale.
3. Adjust T1, T2 and T3 with a non-metallic tuning tool for maximum meter reading.

c. Crystal Filters FL1 and FL2. Crystal filters FL1 and FL2 on module A4 can be adjusted for passband flatness by using the internal calibrate oscillator. Proceed as follows:

1. Set Voltmeter controls as follows:

   a. INPUT SELECTOR to CAL.
   b. ATTENUATOR to -30 DB CAL.
   c. BAND SELECTOR to band A.
   d. TUNING to 250 KC CAL.
   e. SELECTIVITY to 2.5 KC.

2. Adjust TUNING so that meter reads in valley of passband ripple.
3. Adjust C9 and C10 for maximum meter reading.
4. Repeat steps 2 and 3 until filter FL2 passband ripple is within ±.5 DB.
5. SELECTIVITY to 250~.
6. Adjust TUNING so that meter reads in valley of passband ripple.
7. Adjust C7 and C8 for maximum meter reading.
8. Repeat steps 6 and 7 until filter FL1 passband ripple is within ±.5 DB.

d. Local Oscillator. Alignment of the frequency dial is performed by connecting the equipment as shown in Figure 6.

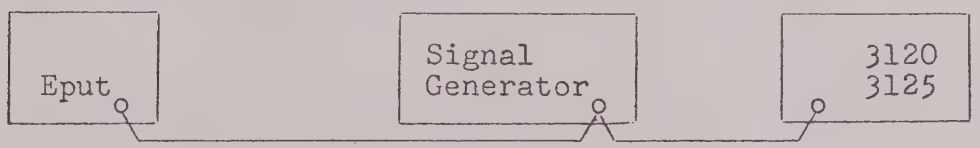


Figure 6
Test Set Up for Frequency Alignment.

1. Set equipment controls as follows:

   a. Signal generator to 0 DB level out.
   b. INPUT SELECTOR to BRIDGE (3120) or BRG 600Ω (3125).
   c. ATTENUATOR to 0 DB.
   d. SELECTIVITY to 250~.

2. Band A alignment.

   a. BAND SELECTOR to band A.
   b. Signal generator to 100 KC.
   c. TUNING to 100 KC.
   d. Adjust L3 for maximum meter reading.
   e. Signal generator to 400 KC.
   f. TUNING to 400 KC.
   g. Adjust C10 for maximum meter reading.
   h. Repeat steps 2b through 2g until dial tracks within ±1 KC on band A.

3. Band B alignment.

a. BAND SELECTOR to band B.
b. Signal generator to 600 KC.
c. TUNING to 600 KC.
d. Adjust L4 for maximum meter reading.
e. Signal generator to 900 KC.
f. TUNING to 900 KC.
g. Adjust C8 for maximum meter reading.
h. Repeat steps 3b through 3g until dial tracks within ±1 KC on band B.

4. Band C alignment.

a. BAND SELECTOR to band C.
b. Signal generator to 1100 KC.
c. TUNING to 1100 KC.
d. Adjust L5 for maximum meter reading.
e. Signal generator to 1400 KC.
f. TUNING to 1400 KC.
g. Adjust C14 for maximum meter reading.
h. Repeat steps 4b through 4g until dial tracks within ±1 KC on band c.

Table 13 Transistor Voltage Chart*

Module	Transistor	Emitter	Base	Collector
A2	Q1	3.7	4.4	9.55
	Q2	2.3	2.1	6.0
A3	Q1	1.85	2.3	6.8
	Q2	1.6	2.0	8.0
A4	Q1	3.3	3.9	9.5
	Q2	2.6	3.3	9.5
	Q3	1.35	2.0	4.6
	Q4	1.9	2.5	3.6
	Q5	1.2	1.9	3.6
	Q6	2.2	2.8	8.9
	Q7	.9	1.5	8.8
	Q8	1.5	2.2	5.0
A5	Q1	9.5	10.3	12
	Q2	0	.65	10.3
	Q3	1.3	1.5	3.5
	Q4	1.7	2.0	7.8
	Q5	1.4	2.2	4.6
	Q6	1.5	2.2	9.2
A6	Q1	1.8	2.4	5.8
	Q2	6.4	7.1	12.0
	Q3	6.4	5.8	0
	Q4	6.2	6.4	12.0
	Q5	0	0	6.4

*Readings taken with VTVM. Readings should be within ±10%.

Set Selective Voltmeter controls as follows:

1. No signal input.
2. CAL LEVEL fully CW.
3. MONITOR - LSB.
4. INPUT SELECTOR - CAL.

5. PARTS LIST.

When ordering parts, always include:

1. Name, Model and Serial Number of the Instrument.
2. Module and circuit symbol.
3. Part number.
4. Description.

Order parts from:

RYCOM INSTRUMENTS
9351 E. 59th Street
Raytown Missouri 64133

Phone 816-353-2100

Note: $10.00 minimum on all orders.

LIST OF MANUFACTURERS

Symbol is listed in parts list under manufacturer.

Symbol	
A	Allen Bradley Company
B	Belden Mfg Company
C	C.T.S. Corporation
D	Continental Device Corporation
E	Dale Electronis, Souix Division
F	E. F. Johnson Company
G	Electra Mfg Company
H	Electro Cube Inc
I	Electro Motive Mfg Co Inc
J	Electron Products Co
K	Electronic Research Corp
L	Erie Technological Products Inc
M	Fairchild Semiconductor
N	General Electric
O	General Instruments
P	General Radio
Q	Gould National Battery Co
R	Hammarlund Mfg Company
S	Mec Incorporated
T	Oaktron Industries Inc
U	RYCOM INSTRUMENTS INC
V	Semicon Inc
W	Spectran Electronics Corp
X	Switchcraft Inc
Y	Sylvania Electric Prod Inc
Z	Texas Instruments Inc
AA	Tower Mfg Corp
AB	Western Electric Co
AC	Wilco Corp

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A1			
C1	Cap, 1.0uf ±10% 100 WVDC mylar	J1-105	J	1
C2	Cap, 0.1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	16
E1	Binding Post, Nylon red	111-102-1	F	2
E2	Same as E1			
E3	Binding Post, metal top Type 938-A	0938-9701	P	1
None	Shorting link Type 938-L	0938-9712	P	1
J1	Connector, electrical 20 pin(Model 3125 only)	KS-14160-L1	AB	1
R1	Res, 140Ω ½W ±1% deposited carbon	RN70D1400F	G	1
R2	Res, 681Ω ¼W ±1% deposited carbon	RN65D6810F	G	1
R3	Res, 1780Ω 1/8W ±1% deposited carbon	RN60D1781F	G	2
R4	Res, 6040Ω 1/8W ±1% deposited carbon	RN60D6041F	G	1
R5	Same as R3			
R6	Res, 4990Ω 1/8W ±1% deposited carbon	RN60D4991F	G	4
R7	Res, 3400Ω 1/8W ±1% deposited carbon	RN60D3401F	G	1
R8	Res, 1580Ω 1/8 W ±1% deposited carbon	RN60D1581F	G	1
R9	Res, 4530Ω 1/8 W ±1% deposited carbon	RN60D4531F	G	1
R10	Res, 499Ω 1/8 W ±1% deposited carbon	RN60D4990F	G	1
R11	Same as R6			
R12	Res, 4870Ω 1/8W ±1% deposited carbon	RN60D4871F	G	1
R13	Res, 158Ω 1/8 W ±1% deposited carbon	RN60D1580F	G	1
R14	Same as R6			
R15	Res, 49.9Ω 1/8 W ±1% deposited carbon	RN60D49R9F	G	1
R16	Same as R6			
R17	Res, 15.8Ω 1/8W ±1% deposited carbon	RN60D15R8F	G	2
R18	Same as R17			
S1	Switch, Rotary (Model 3120 only)	3120S1C	U	1
S1	Switch, Rotary (Model 3125 only)	3120S1B1	U	1
S2	Switch, Rotary	3120S2C	U	1
T1	Transformer, Input	3120A1T1	U	1

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A2			
C1	Cap, 0.47uf ±20% 200 WVDC metalized mylar	210B1C474	H	1
C2	Cap, 0.01uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	13
C3	Cap, 470uuf ±5% 500 WVDC silver mica	DM19E471J	I	1
C4	Cap, 10uf -10+100% 15 WVDC dry electrolytic	BC11-10-15P	S	9
C5	Cap, 0.1uf ±20% 200 WVDC metalized mylar	210B1C104	H	12
C6	Cap, 0.1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	*
C7	Same as C4			
C8	Cap, 250uuf ±5% 500 WVDC silver mica	DM15E251J	I	1
C9	Same as C5			
L1	Coil, RF 1.0mh	U102	AC	6
Q1	Semiconductor Device, Transistor	TI417	Z	19
Q2	Same as Q1			
R1	Res, 10K ½W ±5% carbon	RC20GF103J	A	16
R2	Same as R1			
R3	Res, 680Ω ½W ±5% carbon(Model 3125 Only)	RC20GF681J	A	5
R4	Res, 33K ½W ±5% carbon	RC20GF333J	A	3
R5	Res, 2700Ω ½W ±5% carbon	RC20GF272J	A	4
R6	Res, 68Ω ½W ±5% carbon	RC20GF680J	A	4
R7	Res, 3300Ω ½W ±5% carbon	RC20GF332J	A	4
R8	Res, 2200Ω ½W ±5% carbon	RC20GF222J	A	6
R9	Res, 150Ω ½W ±5% carbon	RC20GF151J	A	1
R10	Same as R4			
R11	Same as R1			
R101	Res, Variable 500Ω 1/8W ±20%	220S501B	C	1
Y1	Crystal 250.0000KC	TYPE CR-46A/U	K	1

*Previously accounted for.

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A3			
C1	Cap, 0.1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	*
C2	Cap, 0.1uf ±20% 200 WVDC metalized mylar	210B1C104	H	*
C3	Same as C2			
C4	Cap, 0.01uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	*
C5	Same as C2			
C6	Cap, 1500uuf ±5% 500 WVDC silver mica	DM19E152J	I	1
C7	Cap, 4000uuf ±5% 500 WVDC silver mica	DM19E402J	I	1
C8	Cap, Variable 2.2-34uuf air dielectric	193-10-5	F	3
C9	Cap, 33uuf ±5% 500 WVDC NPO disc ceramic	0801000C0G0330J	L	2
C10	Same as C8			
C11	Cap, 100uuf ±5% 500 WVDC N220 disc ceramic	0841000R2G0101J	L	1
C12	Cap, 22uuf ±5% 500 WVDC NPO disc ceramic	0801000C0G0220J	L	1
C13	Same as C9			
C14	Same as C8			
C15	Cap, 47uuf ±5% 500 WVDC NPO disc ceramic	0811000C0G0470J	L	1
CR1	Semiconductor Device, Diode	IN3605	N	2
CR2	Same as CR1			
L1	Coil, RF 1.0mh	U102	AC	*
L2	Coil, RF 150uh	3150-12	AC	1
L3	Coil, RF Var 15-25uh	3120L3	U	1
L4	Coil, RF Var 10-18uh	3120L4	U	1
L5	Coil, RF Var 6-12uh	3120L5	U	1
Q1	Semiconductor Device, Transistor	TI417	Z	*
Q2	Same as Q1			
R1	Res, 68Ω ½W ±5% carbon	RC20GF680J	A	*
R2	Same as R1			
R3	Res, 680Ω ½W ±5% carbon	RC20GF681J	A	*
R4	Res, 1000Ω ½W ±5% carbon	RC20GF102J	A	12
R5	Res, 3300Ω ½W ±5% carbon	RC20GF332J	A	*
R6	Res, 10K ½W ±5% carbon	RC20GF103J	A	*
R7	Same as R6			
R8	Res, 2700Ω ½W ±5% carbon	RC20GF272J	A	*
R9	Same as R4			
R10	Same as R4			
S3	Switch, Rotary	3120S3B	U	1
T1	Transformer, Balanced Demodulator	S5-095	W	1

*Previously accounted for.

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A4			
C1	Cap, 0.01 uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	*
C2	Cap, 0.1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	*
C3	Cap, 0.1uf ±20% 200 WVDC metalized mylar	210B1C104	H	*
C4	Same as C2			
C5	Same as C2 (Model 3125 only)			
C6	Same as C1			
C7	Cap, Var. 5-25 uuf 350 WVDC NPO ceramic	0557051C0P039R	L	4
C8	Same as C7			
C9	Same as C7			
C10	Same as C7			
C11	Cap, 68 uuf ±5% WVDC silver mica	DM15E680J	I	1
C12	Same as C1			
C13	Same as C3			
C14	Same as C2			
C15	Same as C2			
C16	Same as C1			
C17	Same as C3			
C18	Same as C2			
C19	Same as C2			
C20	Same as C2			
C21	Same as C1			
C22	Same as C3			
C23	Same as C2			
C24	Same as C2			
C25	Same as C1			
C26	Same as C2			
CR1	Semiconductor Device, Diode	1N277	Y	3
FL1	Filter, Bandpass 2.215 MC, 250 ~ BW	3120FL1	U	1
FL2	Filter, Bandpass 2.215 MC, 2500 ~ BW	3120FL2	U	1
L1	Coil, RF 1.0 MH	U102	AC	*
L2	Same as L1			
L3	Same as L1			
Q1	Semiconductor Device, Transistor	TI417	Z	*
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Same as Q1			
Q7	Same as Q1			
Q8	Same as Q1			

*Previously accounted for.

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A4 (continued)			
R1	Res, 200Ω ½W ±5% carbon	RC20GF201J	A	1
R2	Res, 6200Ω ½W ±5% carbon	RC20GF622J	A	1
R3	Res, 4300Ω ½W ±5% carbon	RC20GF432J	A	1
R4	Res, 10K ½W ±5% carbon	RC20GF103J	A	*
R5	Res, 68Ω ½W ±5% carbon	RC20GF680J	A	*
R6	Res, 680Ω ½W ±5% carbon	RC20GF681J	A	*
R7	Same as R4			
R8	Res, 2700Ω ½W ±5% carbon	RC20GF272J	A	*
R9	Res, 3900Ω ½W ±5% carbon	RC20GF392J	A	2
R10	Res, 390Ω ½W ±5% carbon	RC20GF391J	A	3
R11	Same as R6			
R12	Res, 1300Ω ½W ±5% carbon	RC20GF132J	A	1
R13	Res, 47K ½W ±5% carbon	RC20GF473J	A	2
R14	Res, 18K ½W ±5% carbon	RC20GF183J	A	3
R15	Same as R4			
R16	Same as R9			
R17	Res, 1000Ω ½W ±5% carbon	RC20GF102J	A	*
R18	Same as R13			
R19	Same as R4			
R20	Res, 4700Ω ½W ±5% carbon	RC20GF472J	A	6
R21	Same as R17			
R22	Same as R4			
R23	Res, 2200Ω ½W ±5% carbon	RC20GF222J	A	*
R24	Same as R10			
R25	Not used			
R26	Same as R14			
R27	Same as R4			
R28	Same as R4			
R29	Res, 3300Ω ½W ±5% carbon	RC20GF332J	A	*
R30	Same as R8			
R31	Same as R10			
R32	Same as R6			
S4	Switch, Rotary	3120S4B	U	1
T1	Transformer, IF 2.215 MC	544	E	3
T2	Same as T1			
T3	Same as T1			

*Previously accounted for.

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A5			
C1	Cap, 10 uf -10 +100% 15 WVDC dry electrolytic	BC11-10-15P	S	*
C2	Cap, 100 uf -10 +100% 30 WVDC dry electrolytic	BSQ16-100-30P	S	2
C3	Cap, 0.1 uf ±20% 200 WVDC metalized mylar	210B1C104	H	*
C4	Cap, 200 uuf ±5% 500 WVDC silver mica	DM15E201J	I	1
C5	Cap, 0.1 uf -20 +80% 25 WVDC disc ceramic	5815YU104Z	L	*
C6	Cap, 59 uuf ±5% 500 WVDC silver mica	DM15E590J	I	1
C7	Cap, 0.01 uf ±20% 200 WVDC disc ceramic	08050302'5'U00103M	L	*
C8	Same as C7			
C9	Same as C7			
C10	Same as C7			
C11	Same as C1			
C12	Same as C1			
C13	Same as C7			
C14	Same as C1			
C15	Same as C1			
C16	Same as C1			
C17	Same as C3			
CR1	Semiconductor Device, Diode	SM210	V	1
CR2	Semiconductor Device, Diode	1N277	Y	*
CR3	Same as CR2			
L1	Coil, RF 1.0 MH	U102	AC	*
L2	Same as L1			
Q1	Semiconductor Device, Transistor	TI414	Z	3
Q2	Semiconductor Device, Transistor	TI417	Z	*
Q3	Same as Q2			
Q4	Same as Q2			
Q5	Same as Q2			
Q6	Same as Q2			
R1	Res, 1000Ω ½W ±5% carbon	RC20GF102J	A	*
R2	Res, 820Ω ½W ±5% carbon	RC20GF821J	A	1
R3	Res, 68Ω 2W ±5% carbon	RC42GF680J	A	1
R4	Res, 60.4K 1/8W ±1% deposited carbon	RN60D60R4F	G	1
R5	Res, 10K ½W ±5% carbon	RC20GF103J	A	*
R6	Res, 2000Ω ½W ±5% carbon	RC20GF202J	A	1
R7	Res, 4700Ω ½W ±5% carbon	RC20GF472J	A	*
R8	Same as R1			
R9	Res, 8200Ω ½W ±5% carbon	RC20GF822J	A	2
R10	Res, 2200Ω ½W ±5% carbon	RC20GF222J	A	*
R11	Same as R1			
R12	Same as R1			
R13	Same as R7			
R14	Same as R7			
R15	Res, 33K ½W ±5% carbon	RC20GF333J	A	*

*Previously accounted for.

PARTS LIST

Sym	Description	Part No	Mfr	Tot Qty
	Module A5 (continued)			
R16	Same as R10			
R17	Same as R9			
R18	Same as R7			
R19	Same as R1			
R20	Same as R5			
R21	Same as R10			
R22	Res, 3300Ω ½W ±5% carbon	RC20GF332J	A	*
R23	Same as R1			
S5	Switch, Rotary	3120S5E	U	1
VR1	Semiconductor Device, Diode	1N960B	D	1
Y1	Crystal 2213.5 KC	159	K	1
Y2	Crystal 2216.5 KC	160	K	1

*Previously accounted for.

PARTS LIST

Sym	Description	Part No	Mfr	Tot Qty
	Module A6			
C1	Cap, 25 uf -10 +100% 20 WVDC dry electrolytic	BSK-25-20P	S	1
C2	Cap, 10 uf -10 +100% 15 WVDC dry electrolytic	BC11-10-15P	S	*
C3	Cap, 100uf -10 +100% 30 WVDC dry electrolytic	BSQ16-100-30P	S	*
C4	Cap, 0.1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	*
CR1	Semiconductor Device, Diode	1N914	D	3
CR2	Same as CR1			
CR3	Same as CR1			
Q1	Semiconductor Device, Transistor	TI417	Z	*
Q2	Same as Q1			
Q3	Semiconductor Device, Transistor	2N3638	M	1
Q4	Semiconductor Device, Transistor	TI414	Z	*
Q5	Same as Q4			
R1	Res, 4700Ω ½W ±5% carbon	RC20GF472J	A	*
R2	Res, 10K ½W ±5% carbon	RC20GF103J	A	*
R3	Same as R2			
R4	Res, 2200Ω ½W ±5% carbon	RC20GF222J	A	*
R5	Res, 1000Ω ½W ±5% carbon	RC20GF102J	A	*
R6	Res, 560Ω ½W ±5% carbon	RC20GF561J	A	1
R7	Res, 470Ω ½W ±5% carbon	RC20GF471J	A	1
R8	Same as R7			
R9	Res, 18K ½W ±5% carbon	RC20GF183J	A	*

Previously accounted for.

PARTS LIST

Sym	Description	Part No	Mfr	Tot Qty
	Miscellaneous			
BT1	Battery 12V 1.2 ah nickel cadmium	MP404T	Q	1
C1	Cap, Var. Air 11-150uuf	20101-30	R	1
FL3	Filter, Low Pass	3120FL3	U	1
J1	Connector, electrical power	H1061	AA	1
J2	Jack, Headset	L-12A	X	1
LS1	Loudspeaker	S8837	T	1
M1	Multimeter, Replacement	3005-41	U	1
R1	Res, Var. 25K ½W ±30% with S7	PF3890	C	1
R2	Res, Var. 10K ½W ±30%	NW874b	C	1
S6	Switch SPDT Push button momentary	903	X	1
S7	Switch, SPST Push-Pull part of R1			*
T1	Transformer, Power	3120T1	U	1
WA	Cable Assembly, Power	17258S	B	1

*Previously accounted for.

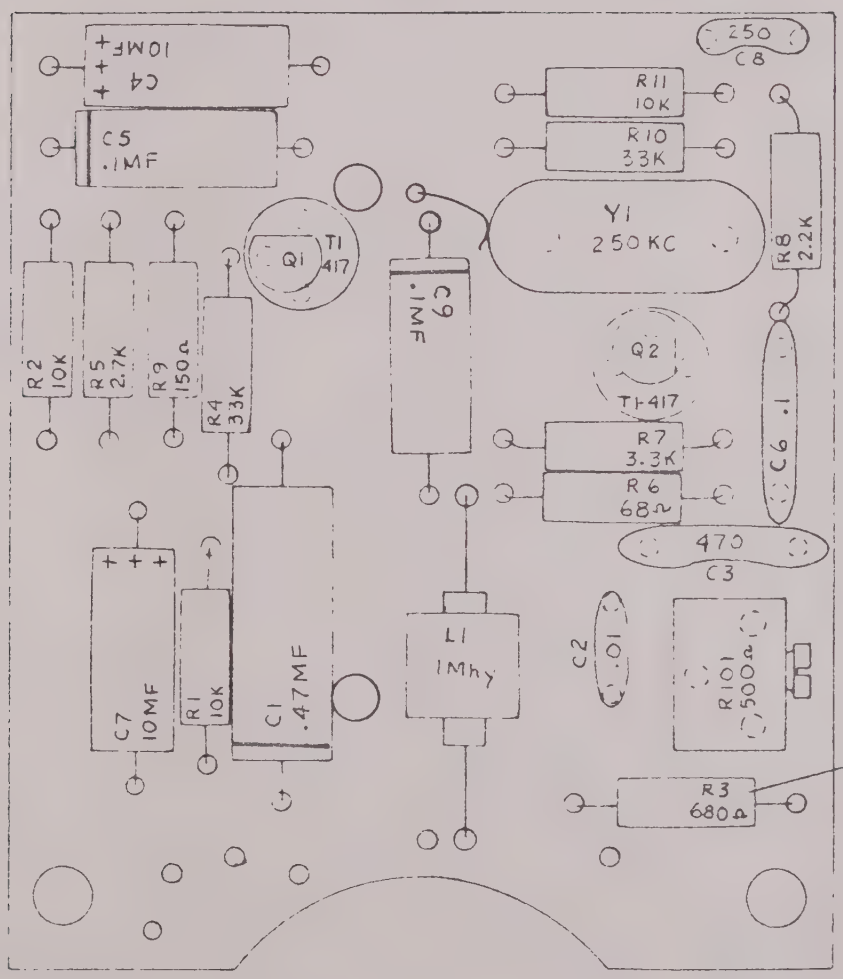


FIG. 7 MODULE A2

REQUENCY
IGNMENT

Band A:
, & C10

Band B:
4 & C8

und C:
5 & C14

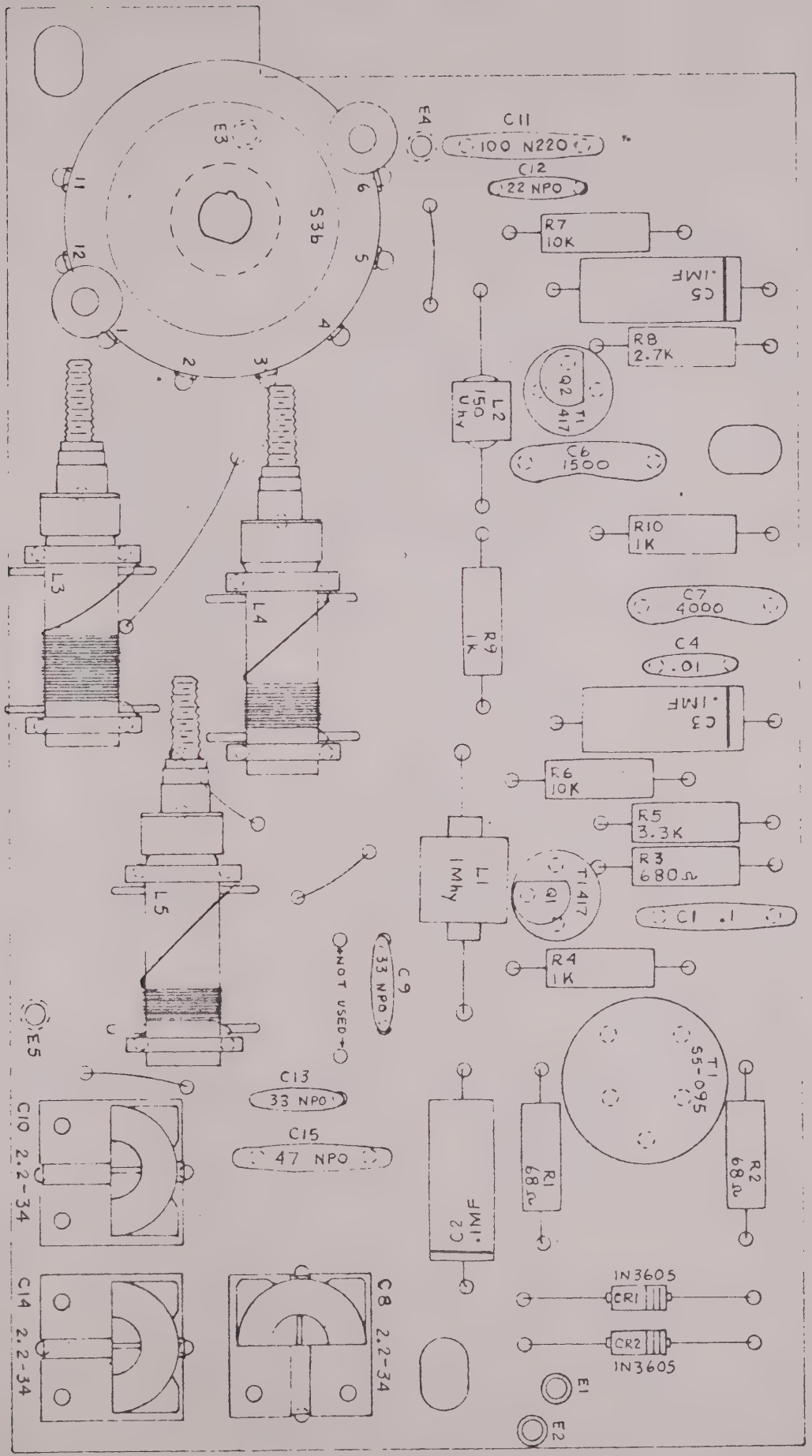


FIG. 8 MODULE A3

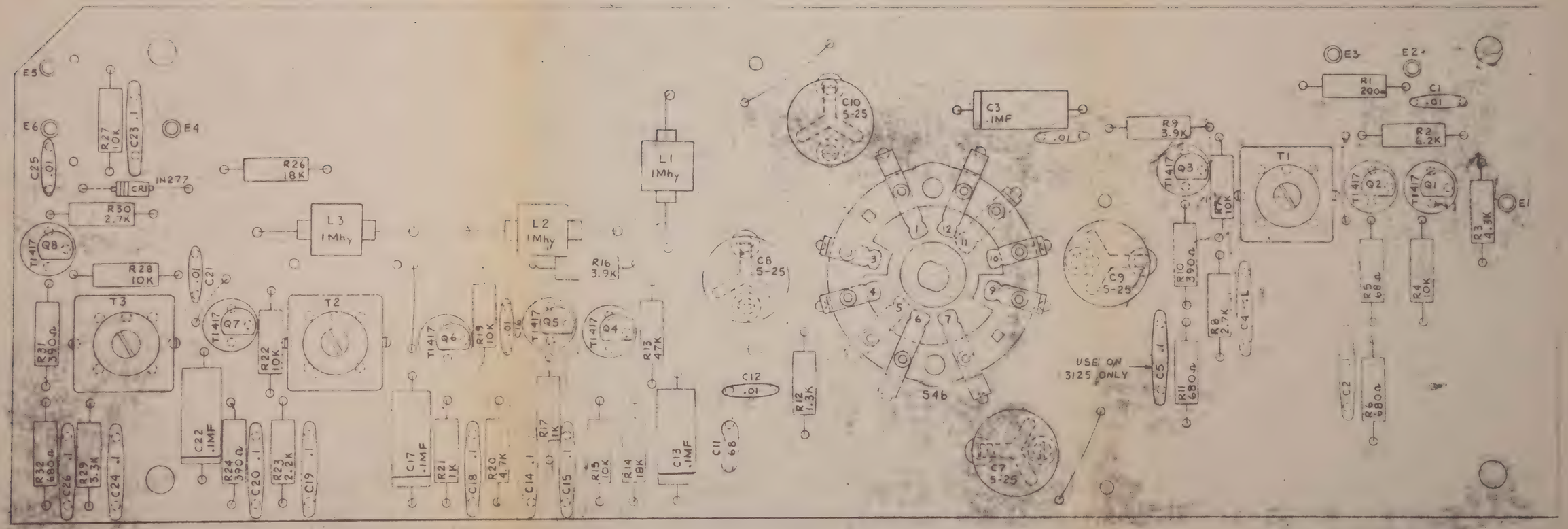


FIG. 9 MODULE A4

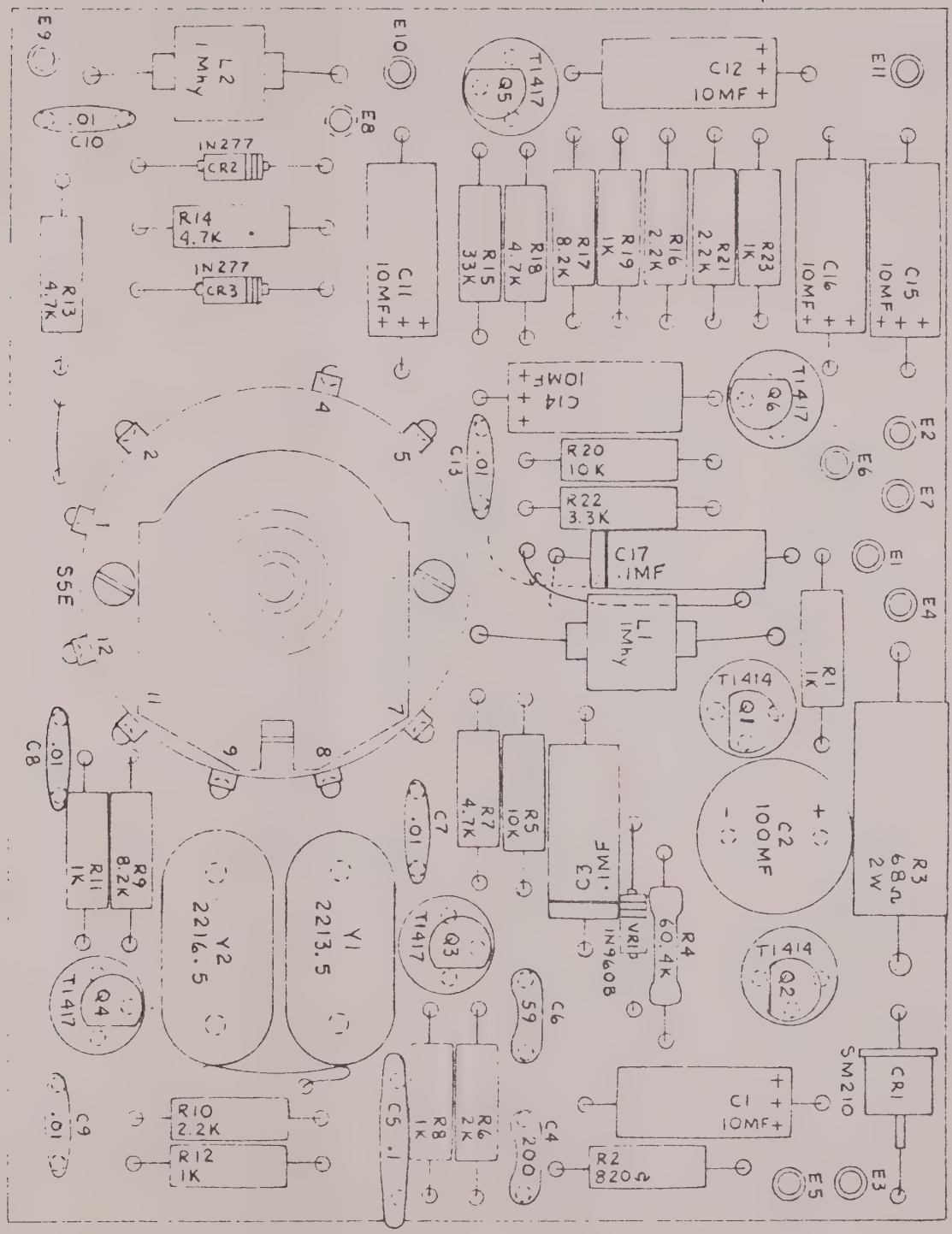


FIG. 10 MODULE A5

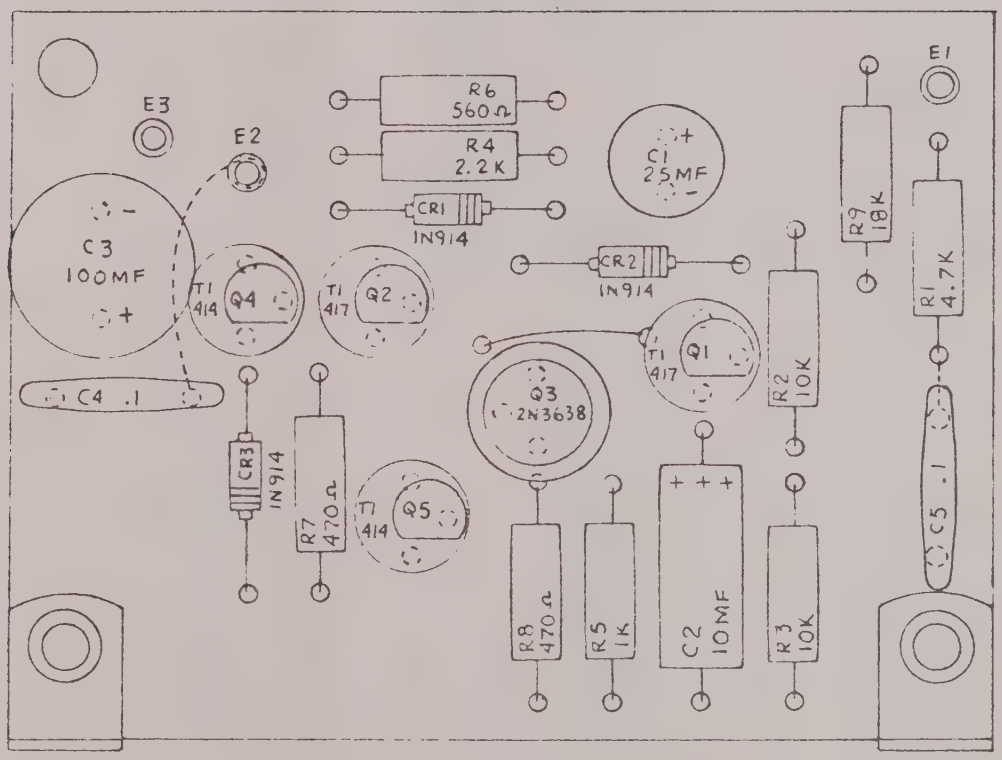
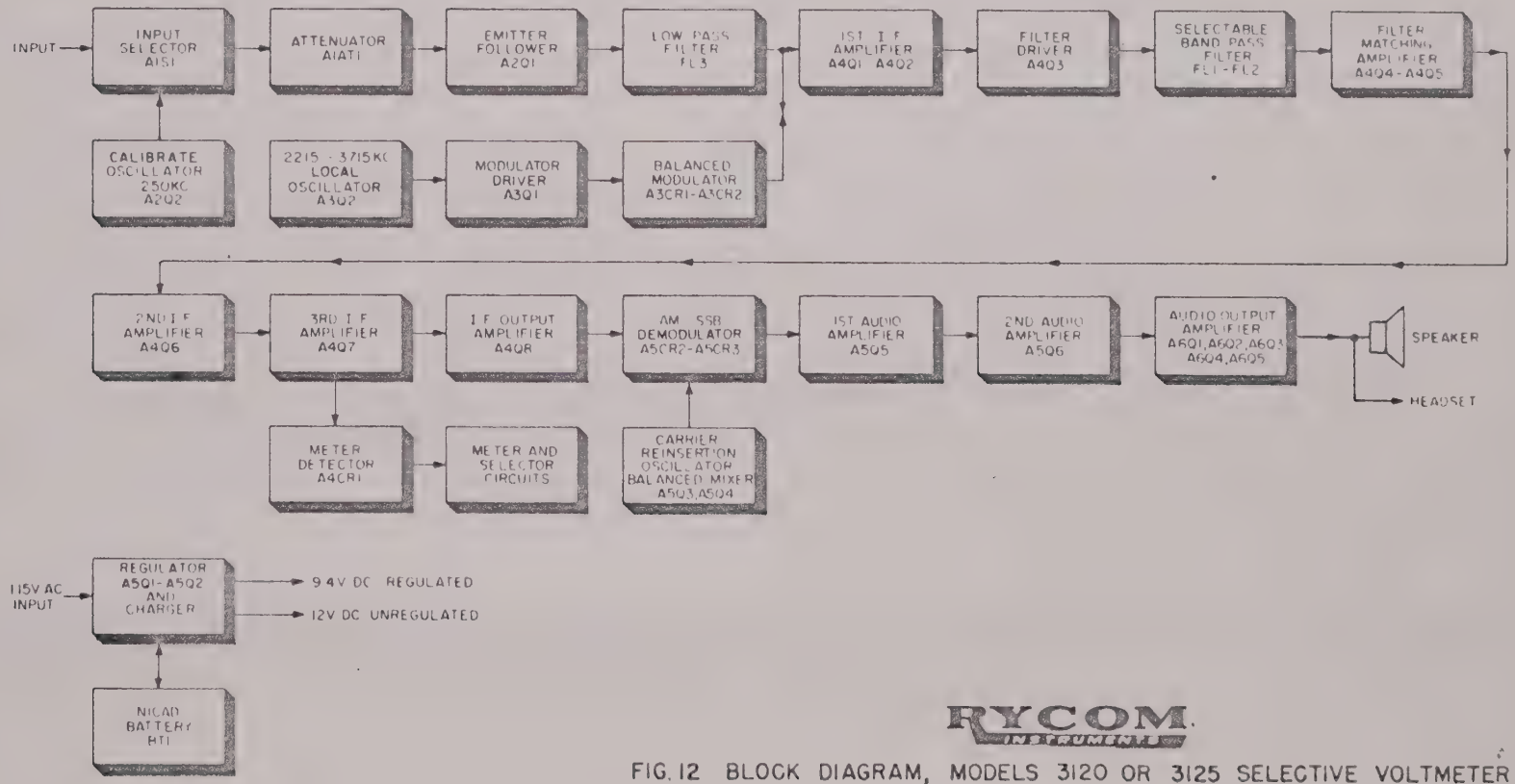


FIG. 11 MODULE A6



RYCOM INSTRUMENTS

FIG. 12 BLOCK DIAGRAM, MODELS 3120 OR 3125 SELECTIVE VOLTMETER

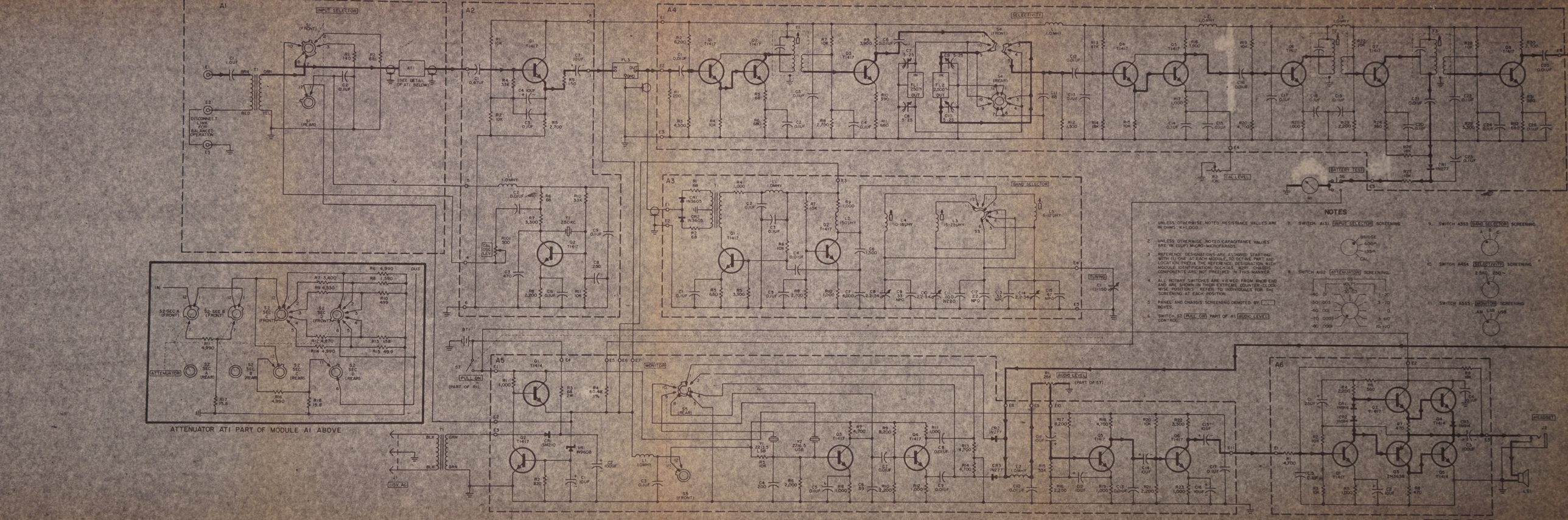

A1
A2
A3
A4
A5
A6
INPUT SELECTOR
SELECTIVITY
BAND SELECTOR
MONITOR
ATTENUATOR
PULL ON
(PART OF R1)
AUDIO LEVEL
(PART OF S7)
CAL LEVEL
BATTERY TEST
TUNING
DISCONNECT LINK FOR BALANCED OPERATION
(SEE DETAIL OF AT1 BELOW)
ATTENUATOR AT1 PART OF MODULE A1 ABOVE
HEADSET
NOTES
1. UNLESS OTHERWISE NOTED RESISTANCE VALUES ARE IN OHMS K=1,000.
2. UNLESS OTHERWISE NOTED CAPACITANCE VALUES ARE IN (1)UF=1 MICRO-MICROFARADS.
3. REFERENCE DESIGNATIONS ARE ASSIGNED STARTING WITH (1) ONE AT EACH MODULE, TO DEFINE PART AND LOCATION. PREFIX THE REFERENCE DESIGNATION WITH MODULE IDENTIFICATION SUCH AS, A2R1. CHASSIS COMPONENTS ARE NOT PREFIXED IN THIS MANNER.
4. ALL ROTARY SWITCHES ARE VIEWED FROM SHAFT END AND ARE SHOWN IN THEIR EXTREME COUNTER CLOCKWISE POSITION(1). REFER TO INDIVIDUALS FOR THE SCREENING AT EACH POSITION.
5. PANEL AND CHASSIS SCREENING DENOTED BY [ ] BOXES.
6. SWITCH S7 [PULL ON] PART OF A1 [AUDIO LEVEL] CONTROL.
7. SWITCH A1S1 [INPUT SELECTOR] SCREENING
8. SWITCH A1S2 [ATTENUATOR] SCREENING.
9. SWITCH A3S3 [BAND SELECTOR] SCREENING.
10. SWITCH A4S4 [SELECTIVITY] SCREENING.
11. SWITCH A5S5 [MONITOR] SCREENING.
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FIG 13. SCHEMATIC DIAGRAM UNDER MOD. NO.

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